In-orbit checkout and timing budget status

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Stanford DRM meeting

The big picture

CGI will have:

- **150 hours of commissioning per mode (for 3 modes)**
- **30 hours of setup time per subsequent observation**

These are Level 3 requirements:

CGIRD-511		CGI Initial On-Orbit Calibration	CGI shall be able to perform initial on-orbit calibration of each coronagraphic mode in <150 hours (TBR), pointing at a V = 2 mag star
CGIRD-512		CGI Regain Calibration	CGI shall be able to regain calibration of each coronagraphic mode previously calibrated on orbit in <30 hours (TBR), pointing at a V = 2 mag star

Since we have three modes:

- **Amortize the common-mode checkout parts of commissioning over all three**
- **Each then gets their mode-specific calibration, alignment and nulling**

Most checkout is done once, and doesn't need to be redone as part of 30 hours

What do these cover?

Commissioning: full period of instrument checkout

- **Health checkout**
  - Bringing all electronics online
  - Checking every mechanism (PAMs, FSM, FocM), visible DM actuator, and camera
- **Alignment and calibration**
  - Do DM registrations with phase retrieval
  - Do coarse mask alignment to get nominal PAM settings per mode
    - Take images/phase retrievals while we'll there for control model
  - Conjugate telescope 1g → 0g motion and make "on-sky" starting mode settings
- **Model assembly**
  - Build diffractive control model in software using calibration data
  - Compute control Jacobian
- **Nulling, per mode**
  - Insert and fine-align all masks for a mode
  - Null for remaining commissioning time in that mode

Really is launch-survival checkout—everything was previously demonstrated in I&T.

Sequence is still in work.

Revisit: Fine mask alignment and nulling only, for the mode in use

Timing budget

Narrow FoV

Commissioning	
Requirement	150.0 hours
Current Best Estimate	**49.1** hours
Reserve	100.9 hours

Turn-on allocation	1.6 hours
Health checkout allocation	7.4 hours
Alignment and calibration	11.3 hours
Jacobian computation	12.0 hours
Initial nulling	16.8 hours

Revisit	
Requirement	30.0 hours
Current Best Estimate	**6.6** hours
Reserve	23.4 hours

Realignment	2.8 hours
Revisit nulling	3.8 hours

Wide FoV

Commissioning	
Requirement	150.0 hours
Current Best Estimate	**52.1** hours
Reserve	97.9 hours

Turn-on allocation	1.6 hours
Health checkout allocation	7.4 hours
Alignment and calibration	12.1 hours
Jacobian computation	23.6 hours
Initial nulling	7.5 hours

Revisit	
Requirement	30.0 hours
Current Best Estimate	**8.1** hours
Reserve	21.9 hours

Realignment	5.3 hours
Revisit nulling	2.9 hours

Spectroscopy

Commissioning	
Requirement	150.0 hours
Current Best Estimate	**87.0** hours
Reserve	63.0 hours

Turn-on allocation	1.6 hours
Health checkout allocation	7.4 hours
Alignment and calibration	12.2 hours
Jacobian computation	13.1 hours
Initial nulling	52.8 hours

Revisit	
Requirement	30.0 hours
Current Best Estimate	**20.7** hours
Reserve	9.3 hours

Realignment	5.3 hours
Revisit nulling	15.5 hours

Preliminary timing budget contains current understanding of operations sequence

- Exposure times derived from pre-mode fluxes
- Hardware motion times drawn from L5/L6 requirements
- Algorithms estimated from processor capability and algorithm complexity

Still many holes

- Many sequences and algorithms only have placeholder timings (e.g. FocM calibration, image pipeline)
- Jacobian calculation speedup from FPGA offload is not confirmed